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**Crain**

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[54] **GATE VALVE**

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[51] Int. Cl.<sup>6</sup> ..... **F16K 3/00**

[52] U.S. Cl. .... **251/329**

[58] Field of Search ..... 251/329, 326;  
137/15

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## [57] ABSTRACT

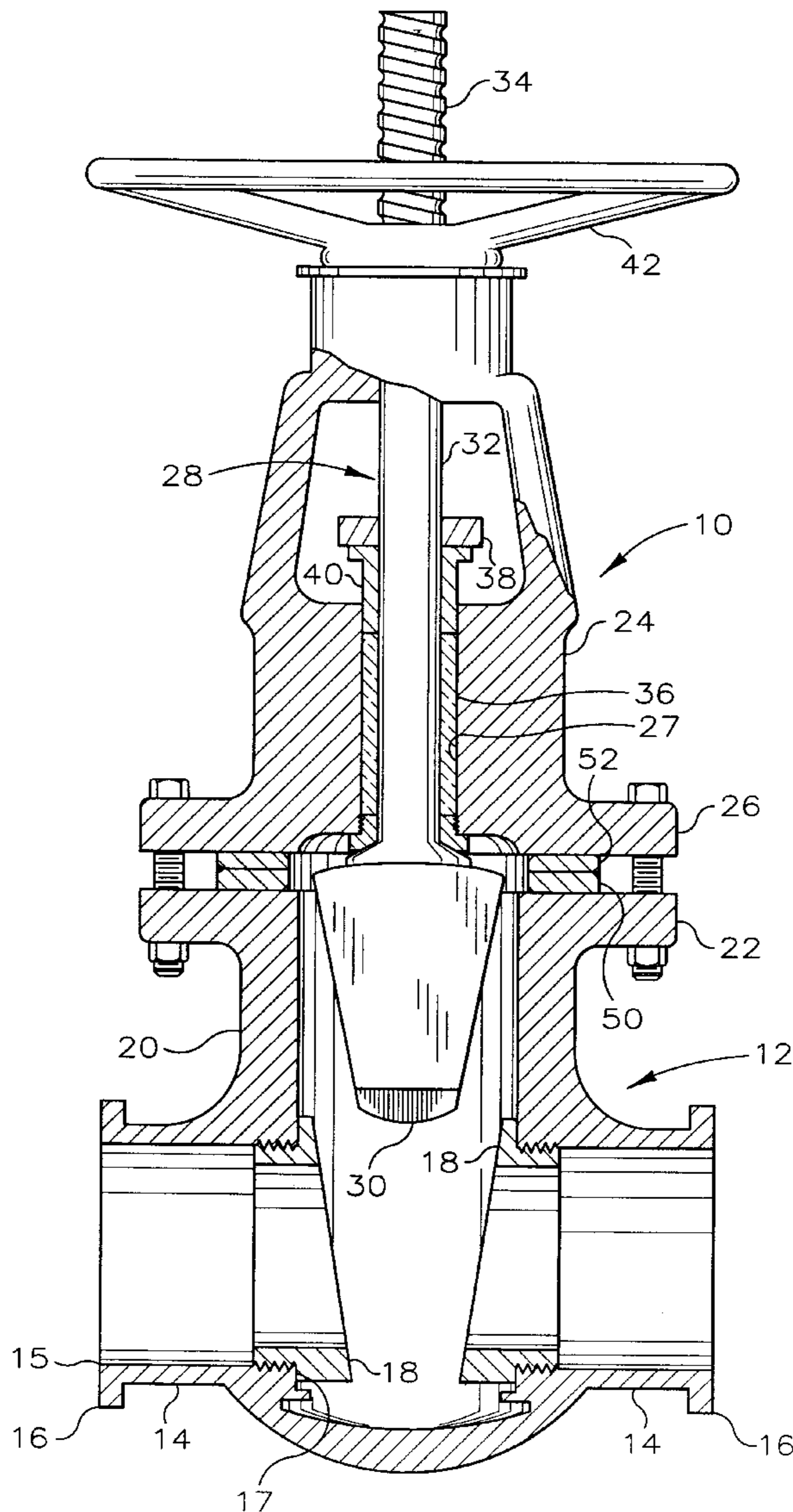
A gate valve having a bolted bonnet is modified by welding a first ring to the valve bonnet and a second identical ring to the valve housing with weld beads on the inner edge of the rings. After mating the bonnet and the housing, a final weld is made joining the outer edges of the two rings.

## [56] References Cited

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**2 Claims, 3 Drawing Sheets**



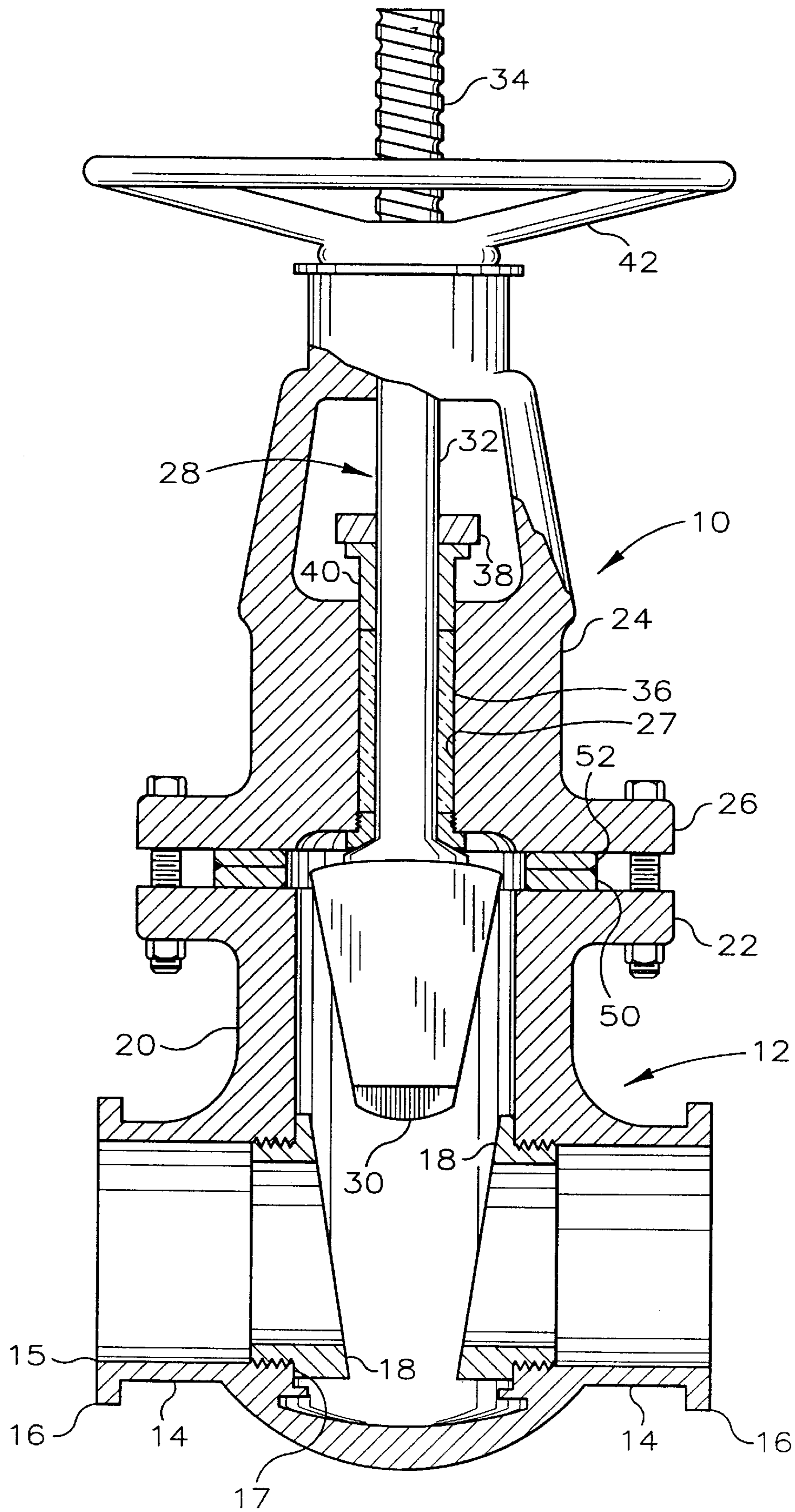


FIG. 1

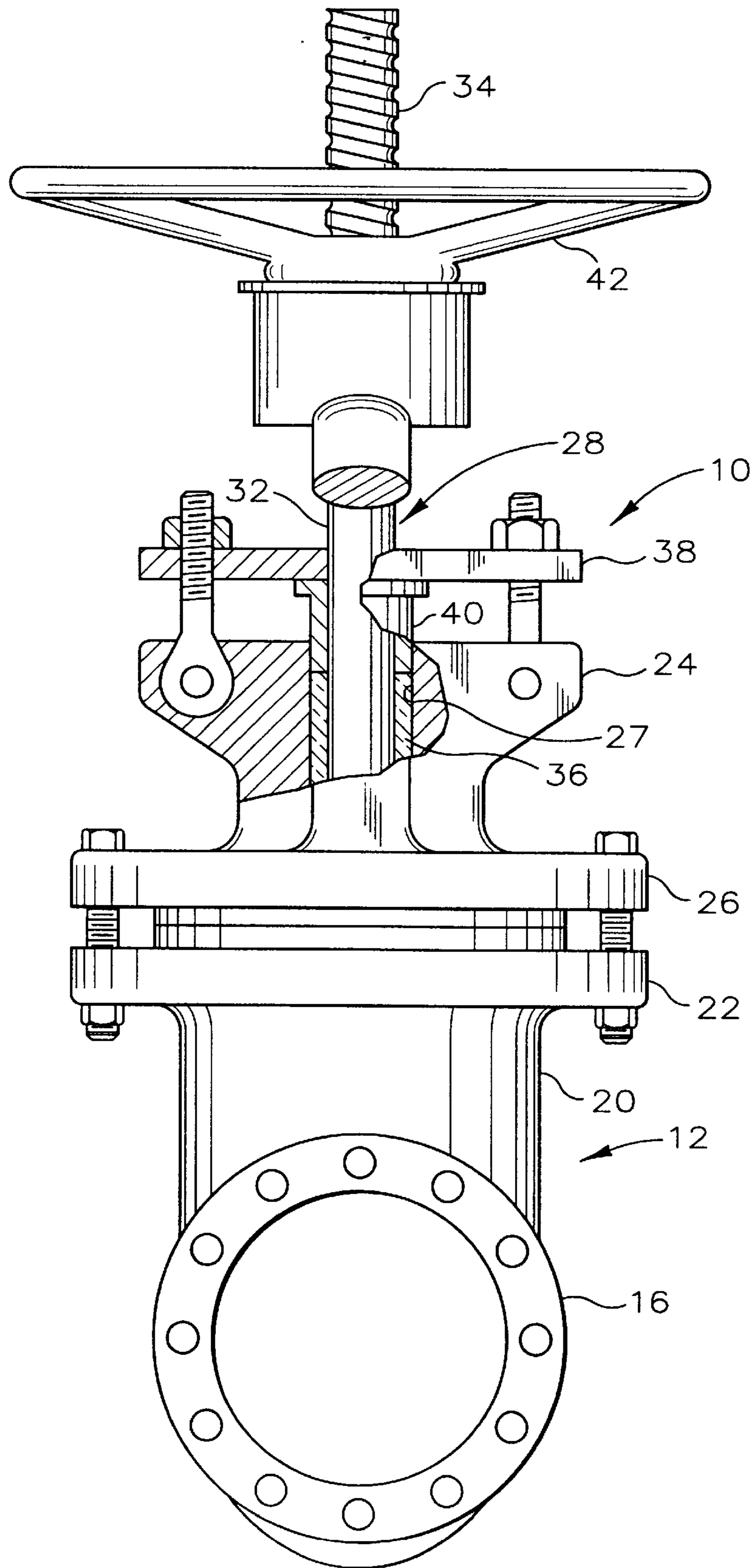


FIG. 2

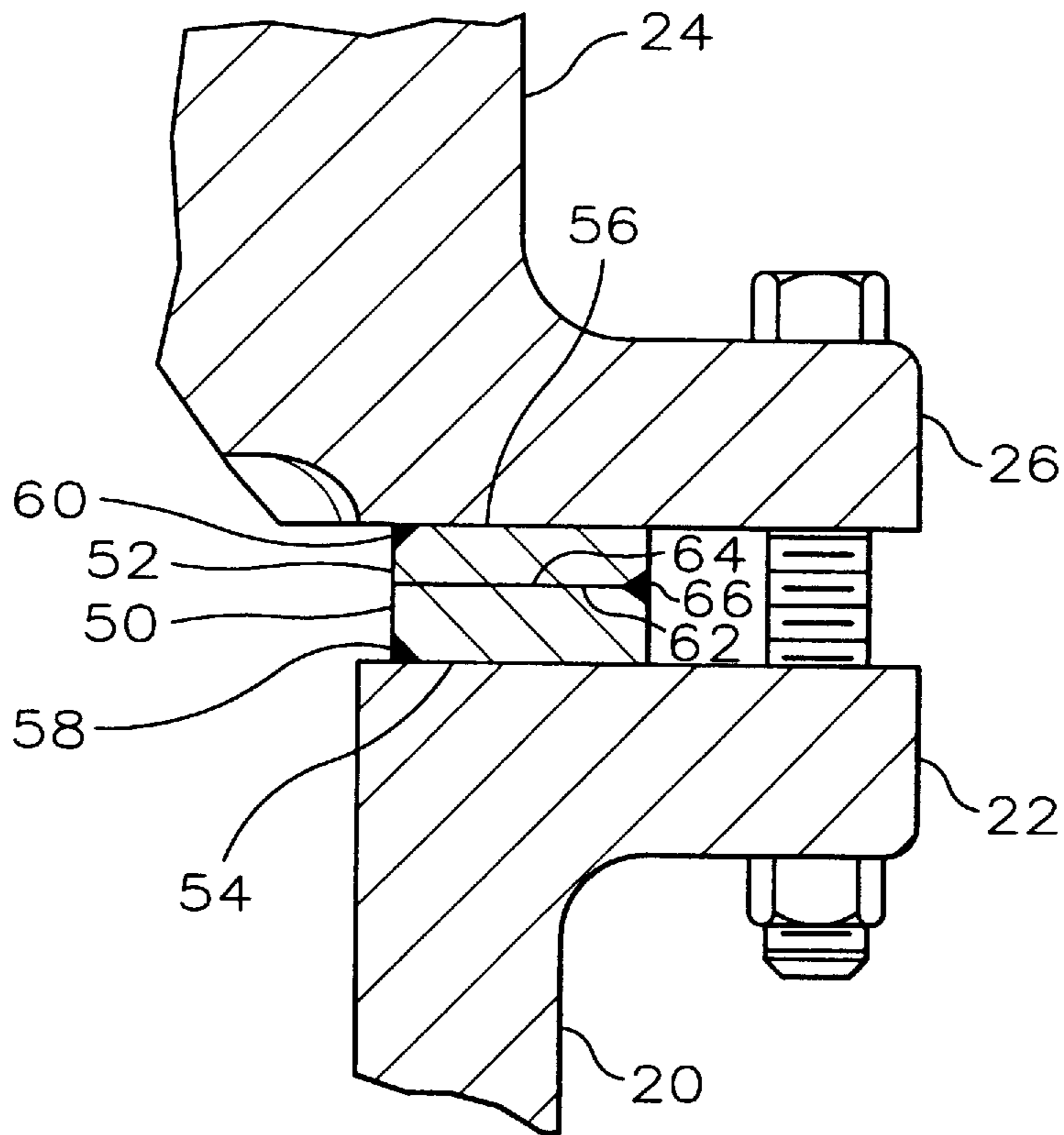


FIG. 3



## GATE VALVE

## BACKGROUND OF THE INVENTION

The present invention relates to valves used to control the flow of fluids under pressure and, particularly, to modifying valves in order to make them suitable for use with fluids under higher pressures than the unmodified valve was suitable for use.

Valve bonnets may be bolted onto the valve body structure or valve housing. Often times such bonnet-housing connections rely upon only a gasket placed between the housing and bonnet to maintain a fluid-tight seal. This is especially true for gate valves where the pressure rating of the valve is generally limited by the integrity of the seal made between the valve bonnet and the valve housing. Thus, for example, the seal between the valve bonnet and housing may leak fluid at a pressure above 600 psi even though structurally the valve is suitable for use with fluids at pressures as great as 1000 psi.

It would, therefore, be desirable to have a method of mounting the valve bonnet on the valve housing which would result in a seal that would allow the valve to be used at higher pressures than when the valve is bolted onto the valve body using a gasket to maintain a seal.

## SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a seal between the valve bonnet and valve housing which can withstand higher pressures than seals that are created by utilizing a gasket between the bonnet and the housing.

The above object is realized in a method of rebuilding a valve structure having a housing with a first flange surface and a bonnet with a second flange surface, wherein the bonnet is connected to the housing so that the first flange surface contacts the second flange surface, so that the pressure under which the valve structure can operate is increased, comprising: removing the bonnet from the housing; placing a first ring, having a first side and a second side adjacent to the first flange surface such that the first side is juxtaposed in contact with the first flange surface to thus form a first interior joint; welding the first ring to the first flange surface at the first interior joint; placing a second ring, having a first side and a second side adjacent to the second flange surface such that the first side is juxtaposed in contact with the second flange to thus form a second interior joint; welding the second ring to the second flange surface at the second interior joint; mating the bonnet with the housing such that the second side of the first ring is juxtaposed to the second side of the second ring to thus form an exterior joint; and welding the first ring to the second ring at the exterior joint.

According to another aspect of the invention, there is provided a gate valve of the type which includes housing means having a hollow interior, opposing coaxial tubular members each having an inner end and an outer end. The inner end of each tubular member terminates within the hollow interior of the housing means with the inner ends spaced apart from each other, an opening formed by a first flange having an axis perpendicular to the coaxes of the tubular members; gate means; and a bonnet having an opening terminating in a second flange and having a hollow interior adapted to receive the gate means, wherein the first flange is coupled to the second flange so that the bonnet is connected to the housing and a portion of the gate means is situated internally of the housing means in a plane normal to

the coaxes and has a closed position engaging the ends of the tubular members providing a fluid-tight seal and preventing flow of fluid through the tubular members and an open position situated beyond the coaxes of the tubular members for enabling flow of fluid therethrough wherein the improvement comprises: a first ring having a first side contacting the first flange to form an interior joint and welded to the first flange, and a second side; a second ring having a first side contacting said second flange to form an interior joint and welded to the second flange, and a second side wherein the second side of the first ring and the second side of the second ring are juxtaposed in contact with each other and form an exterior joint and are welded together.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an illustration of a valve according to the invention, the valve being shown with most of the housing broken away and with parts of the structure situated therein shown in section.

FIG. 2 is an elevation of the valve of FIG. 1 as seen from the right of FIG. 1. The valve is shown with part of the housing broken away and with part of the structure situated therein shown in section.

FIG. 3 is an enlarged fragmentary sectional illustration of the seal formed by the seal rings at the connection between the bonnet and housing.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS. 1 and 2, the illustrated gate valve 10 of the present invention includes a housing means 12 which is of a hollow T-shaped configuration. This housing means 12 is made up of components which are, preferably, wrought, in that the metal thereof can be rolled or forged, so that the housing means 12 is not made of cast metal. This housing means 12 has a pair of opposed coaxial tubular members 14 terminating at their exterior end 15 in circular flanges 16 which serve to connect the valve to suitable pipes so as to provide for the flow of fluid therethrough. Although the flanges 16 are shown as being integral with the remainder of the housing means 12, these flanges 16 can be separate components which are welded to the remainder of the housing means 12. Additionally, if desired, the flanges can be omitted and the interior of tubular members 14 threaded near their end 15 so that a suitable pipe can be connected by means of matching threads. The tubular members 14 terminate at their interior ends 17 in coaxial sleeves 18. It will be seen that in the illustrated example the tubular members 14 are internally threaded while the sleeves 18 are externally threaded and are simply threaded into the tubular members 14.

The central upright portion 20 of the housing means 12 terminates also in a flange 22 which can be an integral part of the housing means or welded thereto and which serves to connect an upper bonnet 24 to the central upright portion 20. The upper bonnet 24 terminates in a lower flange 26 which is mounted on flange 22 for completing the valve structure. The connection of bonnet 24 to upright portion 20 can be better seen in FIG. 3. Flange 22 and flange 26 each have a ring, 50 and 52 respectively, attached on first side 54 and 56 to the flanges by welding at the interior joint formed by the flange and the ring, joints 58 and 60 respectively. Joints 58 and 60 should be welded so as to form a fluid-tight seal. The rings have second sides 62 and 64 which are preferably machined milled to provide flat mating surfaces. The rings 50 and 52 are positioned such that when bonnet 24 is



mounted on upright portion **20**, second sides **62** and **64** are mated. Exterior joint **66** formed by sides **62** and **64** is welded in order to provide a fluidtight seal. The rings **50** and **52** should be made of metal, preferably steel, and are preferably flat thin rings used in joints to prevent leaks. To provide additional structural support, flange **22** and flange **26** can be bolted together.

Returning now to FIGS. **1** and **2**, bonnet **24** has a passage **27** which is adapted to receive a gate means **28**. Gate means **28** has a wedge-shaped head portion **30** and shaft **32** which is threaded at end **34**. Gate means **28** is disposed within bonnet **24** so that shaft **32** extends through bonnet **24** with its longitudinal axis perpendicular to the coaxes of tubular members **14** and the head portion **30** extending into the hollow interior of housing means **12** when the bonnet **24** is mounted on the central upright portion **20**. The portion of shaft **32** within bonnet **24** is surrounded by packing **36** which serves to make a fluid-tight seal between passage **27** and shaft **32**. As can be best seen in FIG. **2**, packing **36** is held in place by means of truss **38** and ring **40**. Ring **40** rests on packing **36** and extends at least partially into passage **27**. Truss **38** is in contact with ring **40** and can be bolted to bonnet **24** so as to apply pressure on ring **40** and, hence, packing **36**.

Shaft **32** has its end **34** operationally connected to a moving means **42** which, as illustrated in FIGS. **1** and **2**, can be turned to open and close gate means **28** by operationally engaging the threads of end **34** so as to move shaft **32**. Although not shown in detail, the construction of moving means **42**, as well as equivalent structures, will be readily apparent to one skilled in the art.

When gate means **28** is in its closed position, wedge shaped head portion **30** engages sleeves **18** providing a fluid-tight seal and preventing flow of fluid through the tubular members. When gate means **28** is in its open position, wedge shaped head portion **30** is situated beyond the coaxes of tubular means **14** for enabling flow of fluid therethrough.

The optimum use of the invention is in the reconstruction of an existing gate valve to enable it to handle higher fluid pressures. To reconstruct an existing gate valve, flange **22** is unbolted from flange **26** and the bonnet **24** is removed from the housing means **12**. A first ring **50** is placed with its first side **54** adjacent to the surface of flange **22** such that first side **54** is juxtaposed in contact with the surface of flange **22** to thus form an interior joint **58**. Flange **22** and ring **50** are welded together at the interior joint **58**. Ring **52** is placed adjacent to the surface of flange **26** such that first side **56** is juxtaposed to the surface of flange **26** to thus form an interior joint **60**. Ring **52** is welded to flange **26** at the interior joint. The bonnet and housing are mated such that second side **62** is juxtaposed in contact with second side **64** to thus form an exterior joint **66**. First ring **50** is welded to second ring **52** at exterior joint **66**. Flange **22** is bolted to flange **26**. Optionally, the second sides **62** and **64** of the rings **50** and **52** can be machine milled to have flat mating surfaces to produce a tighter seal.

While the valve structure has been illustrated in the embodiment of FIGS. **1-3** as a gate valve structure, it is to

be understood that the invention is applicable to other types of valves employing a bonnet type structure. Many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

That which is claimed:

**1.** A gate valve of the type which includes a one piece housing means having an integral first flange having planer surface, a first hollow interior, opposing coaxial tubular members positioned within said housing each having an inner end which terminates within said first hollow interior, and an outer end with said inner ends spaced apart from each other, and an opening formed by the first flange having an axis perpendicular to the coaxes of said tubular members; gate means; and a one piece bonnet having an integral second flange having a planer surface, said bonnet having an opening formed by said second flange and having a second hollow interior adapted to receive said gate means, wherein said first flange is coupled to said second flange by bolts so that said bonnet is connected to and spaced from said housing and said gate means is partially situated internally of said housing means in a plane normal to the coaxes and has a closed position engaging said ends of said tubular members providing a fluid-tight seal and preventing flow of fluid through said tubular members and an open position situated beyond said coaxes of said tubular members for enabling flow of fluid therethrough wherein the improvement comprises:

- a first metal ring forming an aperture and having a first planer side contacting said planer surface of said first flange to form an interior joint and welded to said first flange such that said aperture aligns with said opening formed by said first flange, and a second planer side;
- a second metal ring forming an aperture and having a first planer side contacting said planer surface of said second flange to form an interior joint and welded to said second flange such that said aperture aligns with said opening formed by said second flange, and a second planer side wherein said second planer side of said first metal ring and said second planer side of said second metal ring are machine milled to form mating surfaces and wherein said second planer side of said first metal ring and said second planer side of said second metal ring are juxtaposed in contact with each other and form an exterior joint and are welded together wherein the first and second rings are located radially inward of said bolts and are in fluid communication with said first and second hollow interiors.

**2.** A gate valve according to claim **1** wherein said first metal ring is welded to said first flange at their interior joint to form a fluid-tight seal, said second metal ring is welded to said second flange at their interior joint to form a fluid-tight seal and said first metal ring is welded to said second metal ring at their exterior joint to form a fluid-tight seal.

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